



www.maajournal.com

Mediterranean Archaeology and Archaeometry
Vol. 20, No 3, (2020), pp. 243-256
Open Access. Online & Print.



DOI: 10.5281/zenodo.3960192

SPATIAL ANALYSIS OF THE EFLATUNPINAR AND FASILLAR HITTITE MONUMENTS USING GIS

Hüseyin Zahit Selvi¹, Aslı Bozdağ*², İrfan Bozdağ³ and Güngör Karauğuz⁴

¹*Necmettin Erbakan University, Department of Geomatics Engineering, Konya, Turkey*

²*Niğde Ömer Halisdemir University, Department of Geomatics Engineering, Konya, Turkey*

³*Necmettin Erbakan University, Department of Geomatics Engineering, Master Student, Konya, Turkey*

⁴*Necmettin Erbakan University, Department of Primary Education, Konya, Turkey*

Received: 15/08/2020

Accepted: 17/09/2020

*Corresponding author: Aslı Bozdağ (aslibozdag@ohu.edu.tr)

ABSTRACT

Hittite Empire (13th c. BC) preferred open-air temples, centered around the Tarhuntassa region and the Beyşehir basin, which are estimated to be within the borders of the modern Konya province. The Eflatunpınar and Fasıllar monuments are open-air temples in this region and they are still standing almost 2000 years although they are worn out. The Eflatunpınar monument was included in the temporary UNESCO World Heritage list in 2014. Fasıllar monument, the depictions of mountain god and lions stand out culturally. The aim of this study is to investigate the reasons for the site selection of the Eflatunpınar and Fasıllar monuments while also taking into account the lifestyle and the settlement forms of the Hittites. In the research process, the features of the monuments and their spatial relations with their surroundings and with each other were analysed through maps with the help of Geographic Information Systems (GIS). It was determined that the reasons behind the site selection of these monuments were the land use structure, water and the thought to sacralize it, and the need to reflect the magnificence of the political power and possess strategic transportation routes.

KEYWORDS: Eflatunpınar, Fasıllar, Hittite, GIS, Site selection, Spatial analysis

1. INTRODUCTION

The southern side of the Kızılırmak curve was named as Down Country during the Hittite Empire period 13th c. BC. This region, covering today's Konya Plain, created a buffer zone against the attacks of the Arzawa kingdom 13th c. BC, which was established westward in Anatolia. Besides the region's function as a defensive zone, it is even possible that a headquarters was established here against the anti-Hittite states that could revolt in the West. Because when Muwatalli II (1295-1272 BC) was going to war in Egypt, he moved his headquarters in Hattusa to Tarhuntassa, which is most likely to be in this region.

It is recorded in cuneiform documents that the Down Country was permanently governed by a governor (Goetze, 1933; Goetze, 1940; Archi, 1984). The region was a part of the Hittite State, especially during the empire period. The Tarhuntassa region was among the indispensables of the Hittites from both logistical and religious aspects. Therefore, Muwatalli II wrote that the Down Country had plenty of temples built in the region in the name of their gods (Singer, 1996). Upon returning from the Battle of Kadesh, administration of the region was entrusted to Muwatalli II's son, Kurunta. It is understood that a great deal of zoning and religious activities were carried out in the region during both his own reign and his uncle Hattusili III's reign. Therefore, it is seen that many inscriptions, open-air temples, and road monuments that are apparently built in this period were erected in the region. The two monuments that constitute the subject of the article, Eflatunpınar, which is located about 25 kilometres north of Beyşehir on the road between Beyşehir and Isparta, and Fasillar, which is located about 16 kilometres from Beyşehir on the road between Beyşehir and Seydişehir, are products of this period.

There are various studies about these Hittite works in the literature. Altınsoçlı and Altınsoçlı (2005) studied the ecological and physicochemical properties of the environment in which the works are located. Yakar *et al.* (2011) and Karauğuz *et al.* (2009) created 3D model of the works using photogrammetric methods. The determination of the archaeological and anthropological temporal changes (Nixon, 2004), the examination of the structure of the water cult (Murat, 2012), and the revelation of the geodesic structure of the environment where the works are located (Bahar *et al.* 2007), the determination of the geological and chemical deterioration on the monuments and environments (Bozdağ, *et al.* 2020) are the other studies about these works in the literature. Mellaart (1962) claimed that the Fasillar monument was part of the Eflatunpınar monument and that it was separated from the Eflatunpınar

monument and moved to where it is located today. However, Varlık *et al.* (2016) determined that these two works are separate monuments by using photogrammetric methods.

Archeology is a discipline that compiles and applies various spatial data (Uysal, 2008). The differences between the physical features of the archaeological structures and the environment are usually examined directly from the close surface of these structures (Neubauer, 2004). These differences are also revealed easily, fast and precisely by means of GIS (Geographic Information Systems) (Gaffney *et al.* 1995). Nowadays, spatial analysis, classification, spatial relations analysis, quantitative and statistical analysis, a comprehensive reconstruction and restoration of the existing geomorphological and regional environment and visualization of all archaeological sites and their environment are provided using GIS and 3D GIS technology (Uysal, 2008; Neubauer 2004; Li, 2008; Gao *et al.* 2009; Ciminale *et al.* 2009; Tsiafaki and Michailidou, 2015; Kaimaris, 2018; Abou Diwan, 2020).

The aim of this study, dissimilar to others in the literature, is to analyse the reasons for the creation and location of Eflatunpınar and Fasillar Hittite monuments in their areas with the help of GIS. For this purpose, the agricultural and aquatic potential in the regions of these works, the religious and environmental interaction in the works, and the place of these works in the Hittite geography, both spatially and strategically, were examined by using GIS (DEM, slope analysis, visibility analysis and land use analysis). This examination will contribute to the literature by enabling the formation of new perspectives for studies conducted by different disciplines and the protection and development of the existing works along with other historical touristic works in the region. This study adds innovation to archaeological studies by drawing a framework related to which parameters chosen for determination location, settlement and route by civilizations.

2. MATERIAL AND METHOD

The Anatolian Peninsula, with its geographical and strategic location, has been a religious and commercial centre and home to many civilizations. The Hittites, especially, brought a great civilization into being in Anatolia, shaped their habitation in urban layout, and established open-air temples, centred around the Konya region. The Eflatunpınar and Fasillar monuments, dating back to the Hittite Empire period, are open-air temples and they are still standing today although they are worn out. The works are located in the Tarhuntassa region and the Beyşehir basin, which are estimated to be within the borders of the modern Konya province where the Hittites called the Down Country (Figure 1).

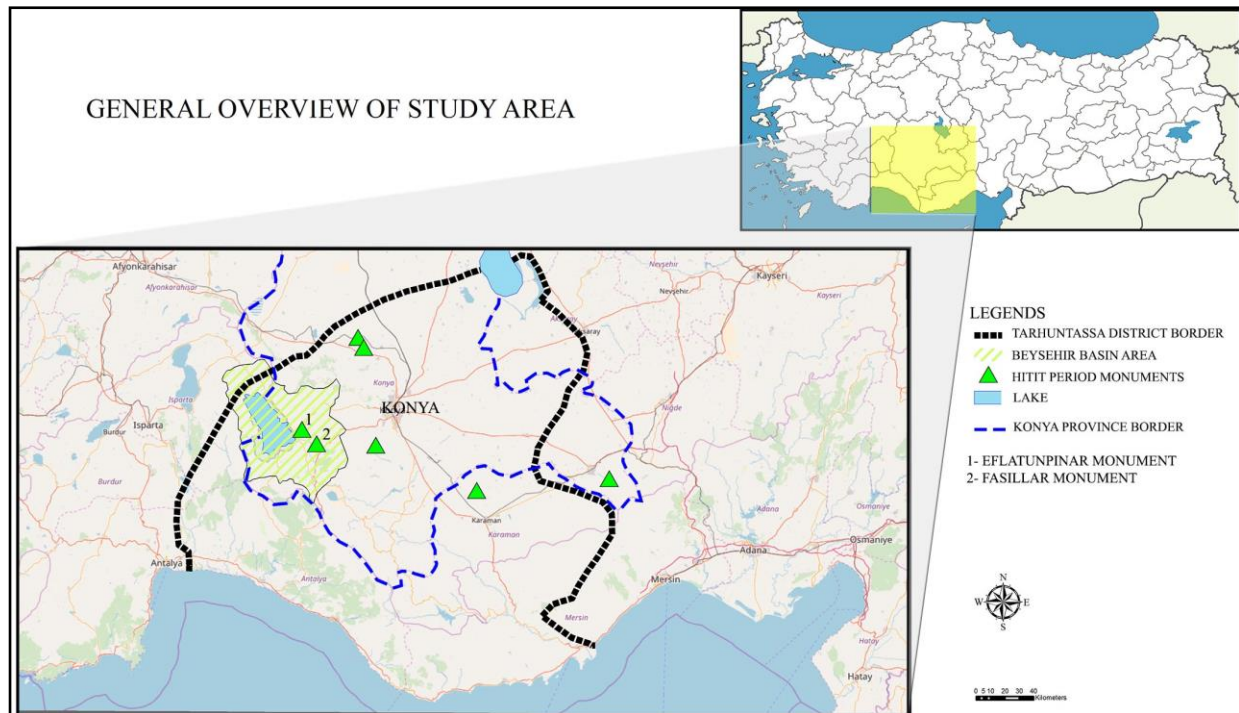


Figure 1. General overview of study area (The map is consisted by utilizing Karauğuz et al. 2009)

There is a pool in front of the Eflatunpınar monument, which was built in the area where a body of water feeding the Konya Beyşehir Lake (Akurgal, 2001). The monument, which was included in the temporary UNESCO World Heritage list in 2014, has a width of 4 meters and a height of 7.5 meters (Varlık et al. 2016) (Fig. 2).

On the façade of the Eflatunpınar monument are some figures carved into stone blocks. One of the figures that are right in the middle depicts a god with a pointed headgear while the other depicts a goddess sitting on a throne. Apart from these two reliefs, mixed entities such as bull-man and lion-man are depicted on the stone blocks on the monument (Erkanal, 1980). The common feature of all the reliefs on the monument is that they "lift their arms like an Atlante carrying the sky adorned with the moon and the stars" (Bittel, 1953). Another feature that stands out in the monument is that these mixed entities aggrandize the winged sun disk at the top of the monument. During the cleaning work in Eflatunpınar, two goddess figures in the sitting position on the right and left sides of the actual monument, and an "inner room" right across these figures were discovered.

It was thought that the Fasillar monument should be placed on the Eflatunpınar monument (Mellart,

1962). The monument was carved into the 20 square-meter face of a giant rock at a height of 8.30 meters (Varlık et al. 2016) (Figure 2). On the monument, the depictions of mountain god and lions stand out (Darga, 1992). Today, there is no water resource or stream in the area where the monument is located (Karauğuz et al. 2009).

These works are seen to be primarily integrated with water, which is a vital substance. On the other hand, the works stand out because they have acquired religious qualifications through the depictions on them and they are located in certain locations in the Tarhuntassa region. Also, these works have been a remarkable research subject for many disciplines with regards to the fact that they provide information related to the cultural and religious structure, the lifestyle, the settlement forms of the Hittites.

Within the scope of the purpose of this study, the reasons for the creation and location of these works in these areas in the settled life planning of the Hittites were analysed. For this, GIS applications, which can examine spatial analyses and interrelate them with each other on maps in a rapid and reliable way, were used.



Figure 2. General view of Eflatunpınar and Fasıllar monuments (Varlık *et al.* 2016)

GIS is frequently used today in studies such as the analysis of the spatial distribution of archaeological sites in archaeological applications (Gao *et al.* 2009), the socio-cultural and spatial analysis of the archaeological space and 3d landscape (Rennell, 2012; Richards-Rissetto, 2017), the site selection analysis of the structures in ancient city areas (Gümüş *et al.* 2017), spatial analysis and interpretation of the maritime connectivity in ancient Mediterranean seafaring (Leidwanger, 2013) and the geomorphologic and spatial examination of the settlement patterns in ancient cities (Oğuz-Kırca and Liritzis, 2017). For the purpose of this study, visibility and slope analyses were carried out in GIS with the aid of the ArcGIS 10.2 software in the examination of the spatial features of the locations of these works.

Visualization of visibility in terms of object and environment in archaeological sites by means of GIS is very significant. In this context, visibility analysis is frequently applied as an important application tool of GIS in the study of archaeological areas. The visibility analysis allows the analysis of the areas in the study area that are visible and invisible from one or more designated observation points (Kol and Küpçü, 2008; Bartie *et al.* 2008). Applications of visi-

bility analysis on three-dimensional real terrain models that were designed by means of GIS in literature were applied in conducting location-based surveys for ancient settlements (Christopherson and Guertin, 1996; Alblas, 2012), identifying cultural routes and historical routes (Bartie *et al.* 2008) and spatial and temporal studies on the change of spatial visibility and distribution of islands and colonies (Kealy *et al.* 2017).

The visibility analysis tool is located in ArcMap, one of the software components of ArcGIS, and provides 3D spatial analysis. For the visibility analysis, first of all the existing maps (1: 25000 scale topographic maps), which have all the details of the land, were provided. These maps are numerical maps that have orthometric height values in the national coordinate system, and which have height curves that are formed according to these height values. The visibility analysis process was started with the modeling of these maps, which includes the elevation values in the digital environment.

In order for the visibility and slope analyses to be carried out, the digital elevation model (DEM), which expresses the topography of the monument and its immediate surroundings, was formed first

(Figure 3). Topography is the most important factor in the formation and development of the settlement with the hills, valleys, slopes, coastal and water areas,

and DEM enables the numerical displaying of the topographic surface (Önem and Kılınçaslan, 2005; Pişkin, 2011; Ögütçü and Kalaycı, 2018).

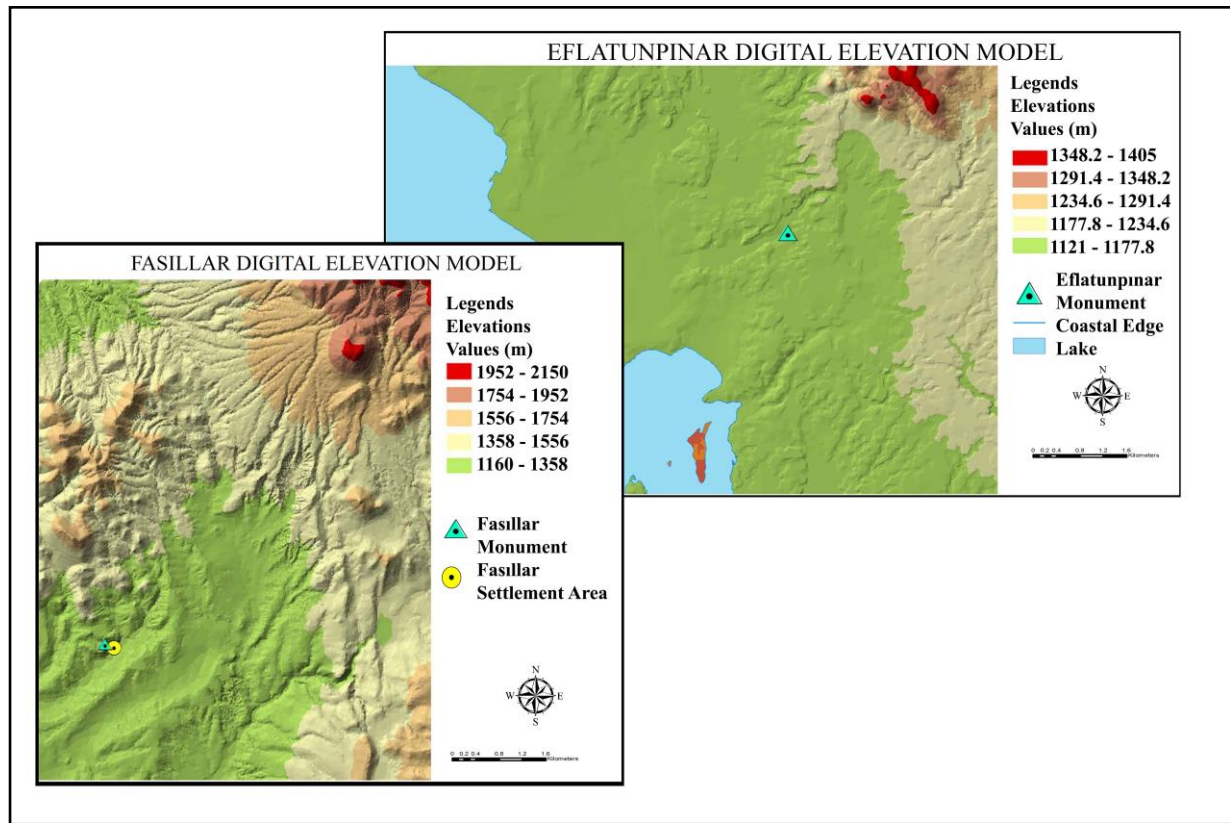


Figure 3. Digital Elevation Models of Study Areas

The visibility analysis maps were primarily formed from the spots the monuments are located while taking their heights into consideration. Secondly, they were formed from three high points chosen nearest to the monuments by assuming the height of the observation tower to be 3 meters in order to achieve cumulative visibility.

With slope analysis maps, the topographical structures of both monuments and their immediate sur-

roundings with regard to their changing slope rates were revealed. In addition, the Konya-Karaman Planning Region 1:100.000 Scale Environmental Plan and Plan Decisions prepared in 2013 and designed Beyşehir-Konya Land Capability Map were used for the purpose of determining the overall agricultural potential and the water assets and their traces located around the monuments and their immediate surroundings (Figure 4).

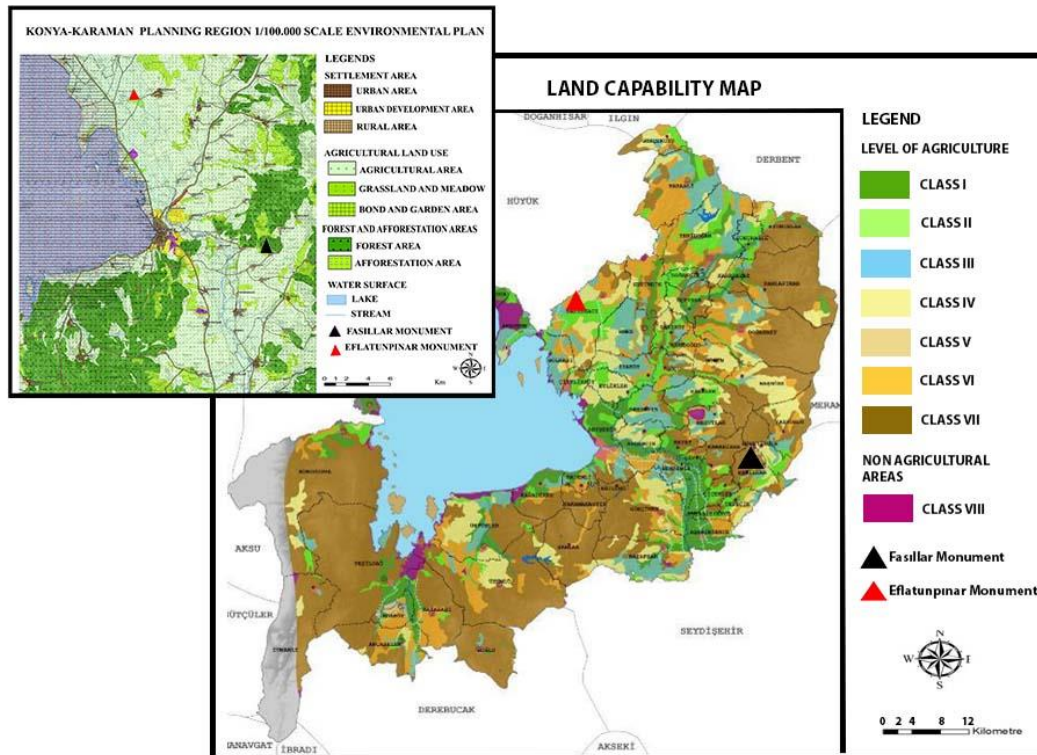


Figure 4. Agricultural potential of monuments' area (Designed by using Yalcin (2016) and Öksüz et al. (2015))

The slope and visibility analysis maps, the environmental plan and land capability map were used in the revelation of the site selection reasons of the monuments based on the literature. In this context, the site selection reasons while establishing the monuments were examined from three different perspectives:

- The works and their environment were examined in terms of agricultural and aquatic potential. For this, the slope and visibility analysis maps, designed in the study area and its immediate surroundings, were used. These maps were evaluated together with the current Environmental Plan.

3. THE ANALYSIS OF THE REASONS FOR THE CREATION AND SITE SELECTION OF THE HITTITE EFLATUNPINAR AND FASILLAR MONUMENTS

Water is very important for all living creatures to sustain their vital needs. For this reason, it is observed that especially since the Neolithic times, sedentary societies have established their first civilizations around water sources.

Hittites, who are one of the earliest civilizations established in Anatolia, established their cities and religious artefacts around water sources, which they attach importance to in terms of religion apart from vital reasons. Therefore, Eflatunpınar and Fasillar

- The depictions on the works were examined in terms of religious elements. The relation of the mountains and similar depictions on the works to the mountain cult in the region was revealed. For this, the cumulative visibility and slope analyses of the study areas and their immediate surroundings were used.
- The works were examined in terms of their positional and strategic importance in the Hittite geography. For this reason, the works and their surroundings were evaluated in terms of their relations with transportation in the macroform and other historical touristic artefacts.

monuments are the surviving works of the Hittites that reflect their interest in water.

Within the scope of this study, these works were analysed in terms of their religious qualities, and positional and strategically site selections along with their vital importance, such as their integration with water assets.

3.1. The examination of the location of the works in terms of aquatic and agricultural potential

In the examination of the works and the aquatic and agricultural potential of their surroundings, visibility and slope analyses were made regarding the works and their surroundings (Figure 5). Also, these

analyses were evaluated together with the land fertile in the Environmental Plan and Land Capability Map as shown in Figure 4. From the building time of the monuments until the present day, man-made structures (such as dam) in the region may affect land cover. A man-made structure (such as dam) built in the study area during this period that could affect the land cover was not identified. For this reason, the current environmental plan and land capability map were used to investigate the land productivity of the region.

According to the slope analysis, the altitudes around the Eflatunpınar monument and its immedi-

ate surroundings varies between 1121 and 1184 metres. The slope increases in the northeast side of the monument. It is seen from the slope analysis that the riverbed in front of the monument, which still exists, forms a valley. When the location of the monument was analysed using the slope and visibility analysis, it was determined that the monument was established at a point overseeing a big part of the riverbed's route, which starts from the beginning of the valley and then disembogues into the lake. It can be said that the monument is located at a focal point overseeing the water source and its route.

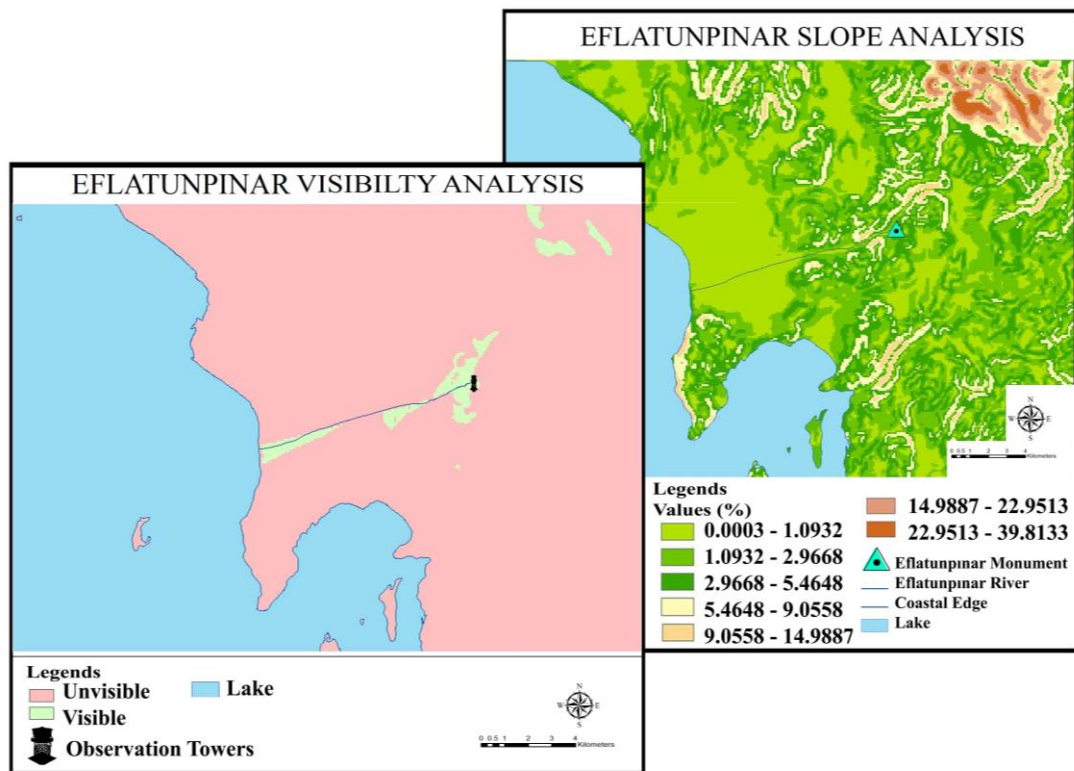


Figure 5. Examination of the Eflatunpınar monument and its surroundings in terms of visibility and slope analysis

It has been shown in recent studies that there have been changes in the shore edge lines of water sources like lakes due to reasons such as excessive irrigation and the unsustainable use of water sources. In a study conducted in the literature (Yiğit-Fethi et al. 2015), it was determined that the shore edge line of the Beyşehir Lake was withdrawn between the years 1960 and 2013 due to the decrease in water mass. Considering the time when the Beyşehir Lake was first formed and the Eflatunpınar monument was built, it is estimated that there have been changes over the lake in the past 2000 years. For this reason, it can be said within the scope of the slope and visibility analysis that the monument was built at the time in a spot overseeing the Beyşehir Lake,

together with its water source and the route created by the riverbed.

Apart from the slope and visibility analysis, it is seen that today, Eflatunpınar monument is located in a fertile and 2nd class agricultural potential area according to the Environmental Plan and Land Capability Map as shown in Figure 4. Reason behind the Hittites' choice to settle in this area during their lifetime is agricultural fertility and it is understood that the Hittites used water sources appropriately in agriculture to provide food. For this reason, the Hittites built their monuments as sacred spaces where the necessary rituals were made in order for their gods to send them the sufficient water in high-potential agricultural areas.

The Fasillar monument was examined similarly to the Eflatunpinar monument (Figure 4 and Figure 6). According to the slope analysis, the altitudes around the Fasillar monument and its immediate surroundings varies between 1160 and 1380 metres. The slope increases in the mountain-covered north side of the monument. It is observed that the monument is located on a 25% slope within this area. The slope decreases in the southern part of the monument and the valley beds formed by the streams are concen-

trated. While there are no water assets such as an active water source or lake in front of the monument today, the valleys thought to belong to the riverbeds as seen from the slope analysis are located in the area where the monument is found. When the location of the monument was analysed using the slope and visibility analysis, it was determined that the monument was established at a point overseeing the valley where the riverbed is located.

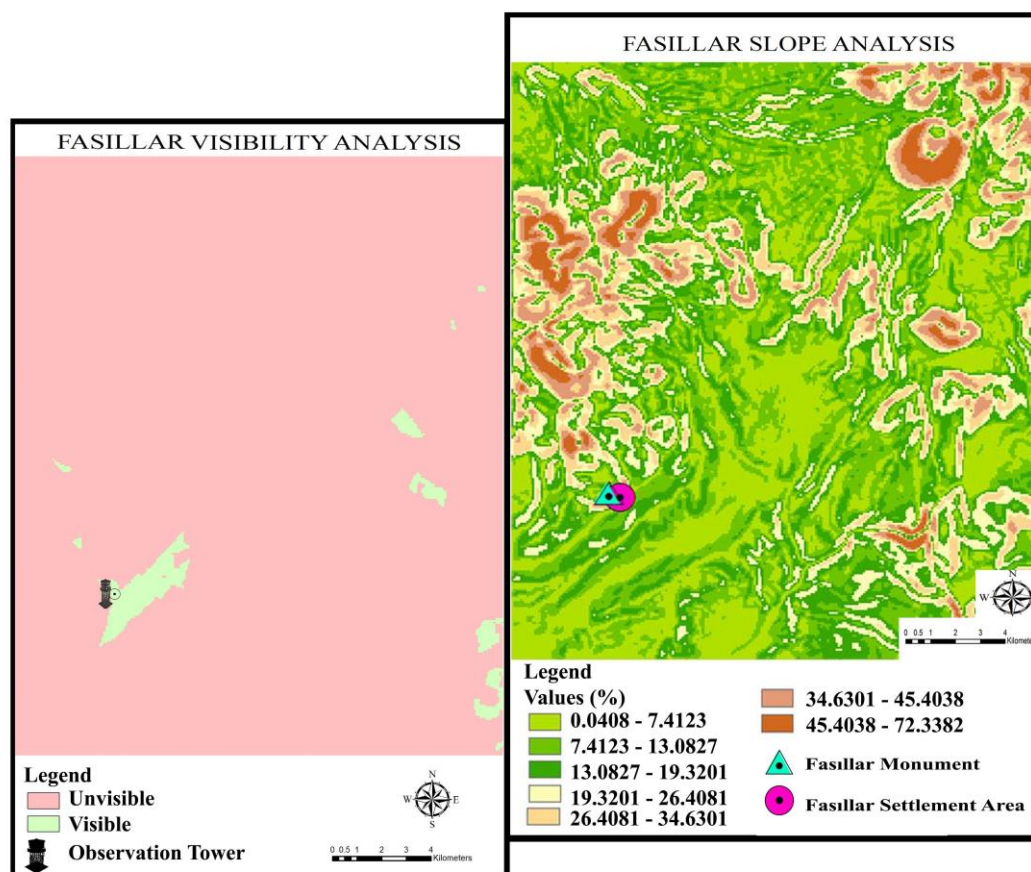


Figure 6. Examination of the Fasillar monument and its surroundings in terms of visibility and slope analysis

The Fasillar monument is located in a fertile and 4th class agricultural potential area according to the Environmental Plan and Land Capability Map as shown in Figure 4. The monument was founded on a high hill to express the sanctity of the mountain that carries the underground waters. Although it does not possess a water source like the Eflatunpinar monument does, it can be said that the Fasillar monument has qualities concerning the sacralisation of the water assets it oversees from the point it is located because of the depictions on it. In addition, the monument shows the sanctity of the arable land which can be seen from the monument's location.

The reasons for the site selection of both monuments, integrated with the water assets in the loca-

tions where they were established, were examined in terms of the slope, visibility and agricultural potentials of the monuments and their surroundings. Ultimately, it can be stated that the locations of the works were chosen with the aim of being located in agriculturally dominant places and sacralising the water assets by being integrated with monuments.

3.2. The examination of the site selection reasons of the works in terms of the religious depictions (mountain god and so on) on them

In the examination of the religious depictions (mountain god and so on) on the Eflatunpinar and Fasillar monuments, the depictions of mountain god

related to the mountain cult are important. While the depictions on the monuments clearly reveal the fact that these works are religious, the Fasillar monument designated the Hittites' path to the south, and the Eflatunpinar monument designated their path to the west (Karauğuz, 2005). The Mountain God in the

Hittite world was represented the idea that the rains were brought from the clouds coming from the mountains (Ökse, 2011). It may be thought that this idea is reflected in the depictions in both monuments (Figure 7).



Figure 7. Depictions of Eflatunpinar and Fasillar monuments mountain gods (Varlik et al. 2016)

The slope analysis of the Eflatunpinar monument and its immediate surroundings and a cumulative visibility analysis from altitudes in the nearby mountains were performed (Figure 8). According to cumulative visibility analysis made from altitudes in the chosen nearby mountains, The Eflatunpinar monument, which is in a water source in the valley, is observable from nearby mountains. The waters gushing out of the belly of the mountain god in the depictions on the Eflatunpinar monument can be interpreted as the monument is a spring that carries the underground waters from the mountains (Figure 7). In this context, it can be thought that in the religious thought of the Hittites, the location of the Eflatunpinar monument was perceived as a site that rests on the mountains and returns the water obtained from these mountains to the earth as the gift of the gods.

The Fasillar monument was examined similarly to the Eflatunpinar monument (Figure 9). The Fasillar monument, in terms of its location of establishment, is located as a rock monument in a hillside area of the stream that is dry today. When the slope analysis of the immediate surroundings of the Fasillar monument was examined, it was determined that its back part rested on the mountains and its front side faced the dry stream. The monument and the mountain god and storm god figures on it were built big enough to be seen from afar. It is also visible according to the visibility analysis created from the nearest settlement area and its surroundings. In this context, the monument was formed in the hillside in gigantic size that is visible from afar, by choosing a site that shows the existence of water and reflects the mountain cult.

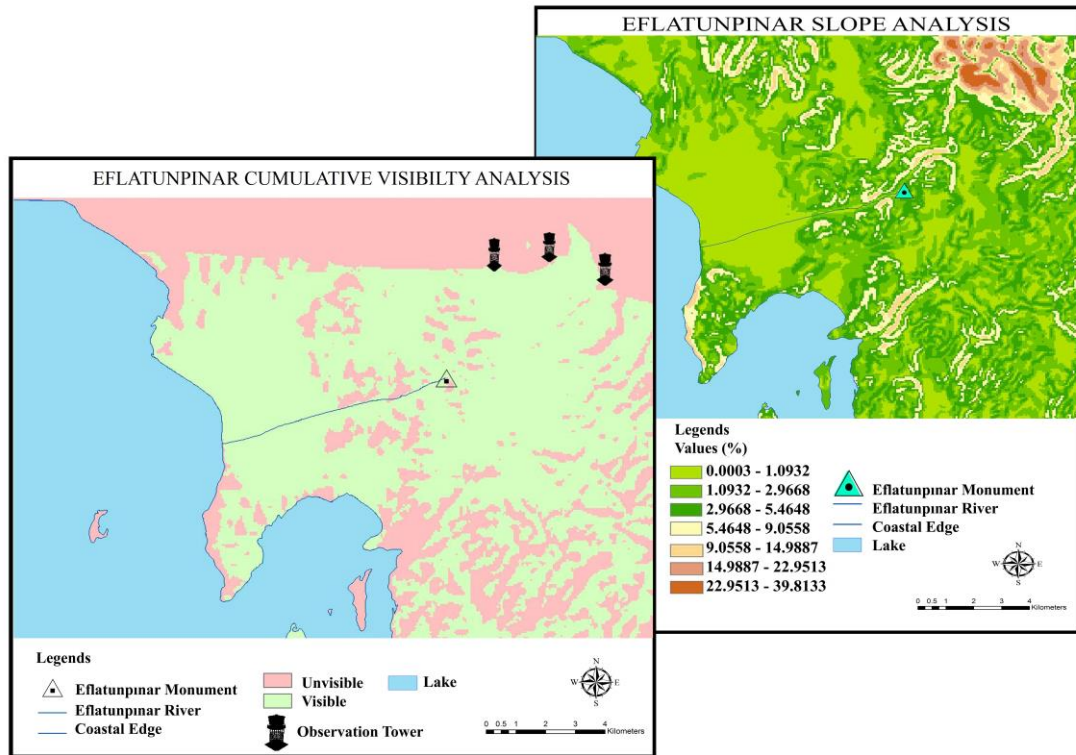


Figure 8. Examination of the Eflatunpınar monument and its surroundings in terms of cumulative visibility and slope analysis

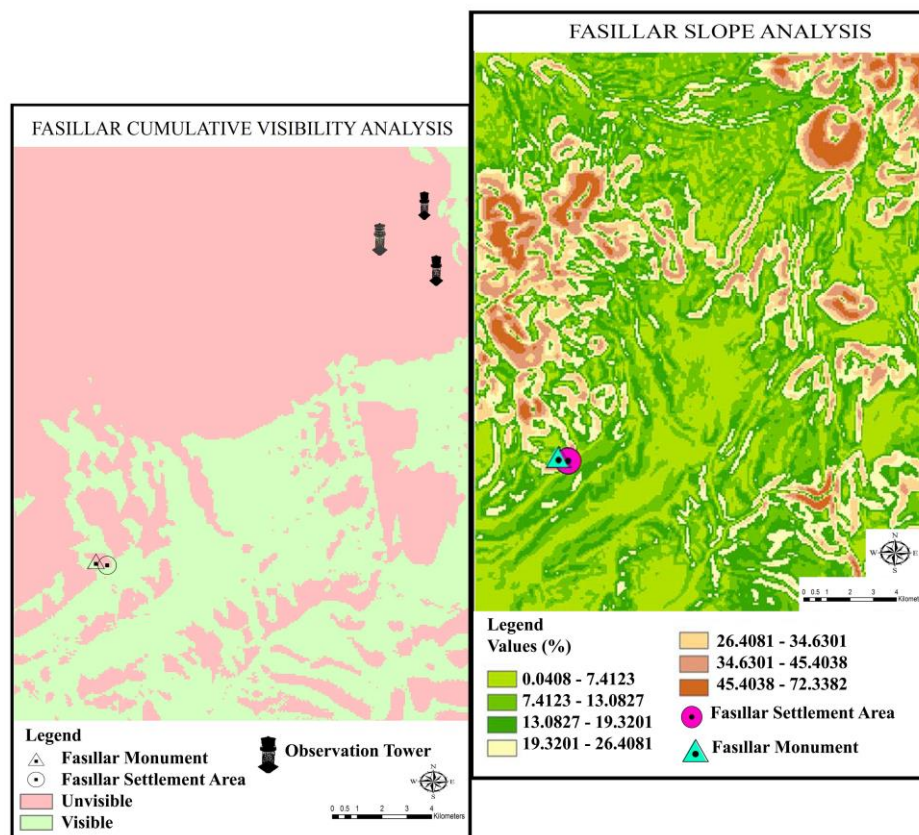


Figure 9. Examination of the Fasillar monument and its surroundings in terms of cumulative visibility and slope analysis

3.3. The revelation of the importance of the works in the Hittite geography in strategical and positional terms

The Hittite monuments, which are still standing today in the Tarhuntassa region even though they are worn out, show that this region is very important in the political, religious, and daily life of the Hittites. Tarhuntassa Region is also important in meeting the food needs of the Hittites by the meeting of its fertile soil with water. The Hittites built these monuments to sometimes sacralise the water sources, and to sometimes express the political boundaries of the Hittite state. This is one of the ways that states used throughout history up to this day to reflect their magnificence and government power.

The southern part of the Tarhuntassa area consists of mountains parallel to the sea. With today's developing technology, the means of transportation towards the south have been improved. However, throughout history, transportation has been provided from certain routes, which determined by the states in specific conditions. The works Eflatunpınar and Fasillar were the two important gates of the Hit-

tite state in the Tarhuntassa region in this sense. The Eflatunpınar monument was their gate to the west (Arzawa), and the Fasillar monument was their gate to the south (Lukka) (Figure 9). It can be said that the Hittites built these magnificent structures in these regions as they attached strategic and political importance to the routes of the state to the south and west. These monuments can be considered as important strategic structures for the Hittite State with their location and magnificence.

In this study, the historical and touristic features of these monuments were examined together with other monuments in the region that belong to the Hittite period and carry a water cult. (Figure 10). Accordingly, it is remarkable that other monuments also have sacred depictions reflecting the water cult, similar to the monuments examined, and are also established in fertile agricultural lands.

Today, the locations of these monuments can be considered as an important historical-touristic route for researchers and tourists because they reflect the characteristics of the Hittite period. The route can be made more interesting by establishing a connection with Cappadocia in the east.

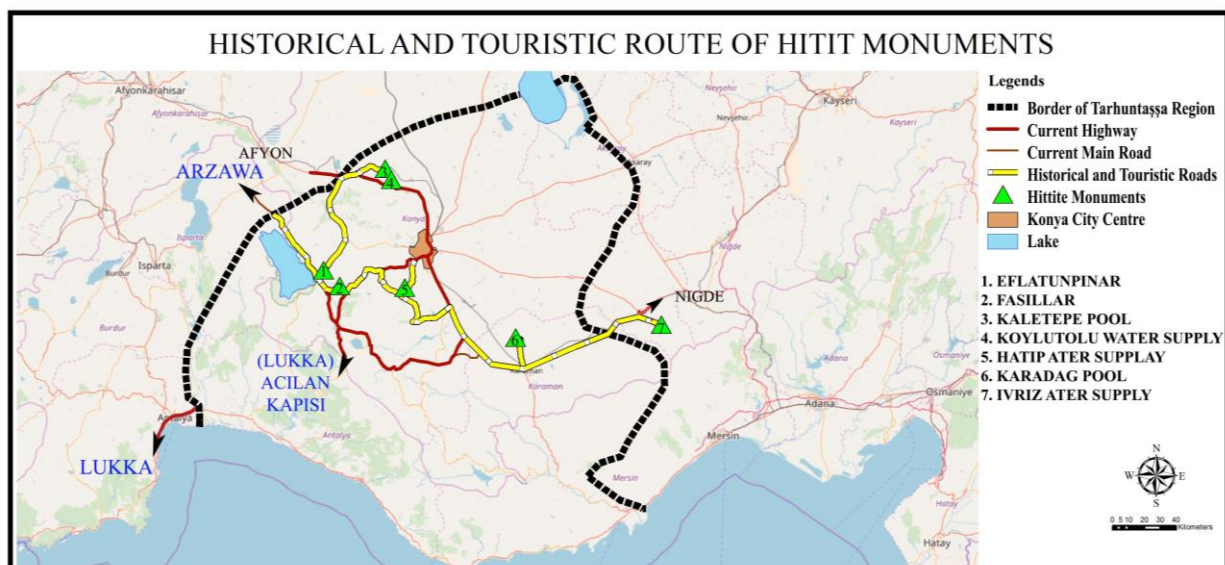


Figure 10. Hittite period monuments in Tarhuntassa District

4. CONCLUSION

Today, it is revealed with archaeological remains and researches that the Hittites have a special place in the history and the geography of Anatolia. Especially the monuments and artefacts located in the Tarhuntassa region, give important information about the religious and political life of the Hittites.

In this study, the Eflatunpınar and Fasillar monuments located in this region were examined in or-

der to contribute to the investigation of settlement, spread and change processes related to the Hittite civilization. The features of these monuments, the reasons for their creation and their location were analysed with the help of GIS through the existing maps. Within the scope of the analyses and the literature, the reasons for the location of the monuments in these areas were revealed. It has been determined

that the locations of the monuments were chosen for the purpose of;

- integrating with water in water assets and their surroundings,
- ensuring regional dominance in regions where agricultural production is intensively carried out,
- sacralising the water sources and rivers for vital reasons, and
- demonstrating the magnificence of the Hittite civilization in the spatial and strategic transportation routes.

Within the scope of the study, it was determined that the monuments whose site selection reasons were revealed, were located by the Hittites not by chance but in agriculturally, religiously and positionally significant and strategic spots. At the same time, Mellaart's argument that the two monuments are complementary and part of each other is disproved by this study. For future studies, it is thought that analysis of the other monuments located in the Tarhuntassa region along with these two monuments using GIS techniques, would shed light on the Hittite civilization and the formation process of these monuments.

REFERENCES

- Abou Diwan, G (2020) GIS-based comparative archaeological predictive models: a first application to iron age sites in the Bekaa (Lebanon). *Mediterranean Archaeology and Archaeometry*. Vol. 20, No 2, 143-158 DOI: 10.5281/zenodo.3819601
- Akurgal, E. (2001) *The Hattian and Hittite Civilizations*. Publications of Republic of Ministry of Culture. Ankara.
- Alblas, L. (2012) Archaeological visibility analysis with GIS. *The Council of European Geodetic Surveyors*, pp. 1-7.
- Altınışçılı, S. and Altınışçılı, S. (2005) The Ostracod (Crustacea, Ostracoda) Fauna of Ancient Eflatunpınar Spring (Beyşehir, Konya, Turkey). *Ecology*, Vol.14, (54), pp.13-19.
- Archi, A. (1984) *Anatolia in the Second Millennium, B.C.* Circulation of Goods in Non-Palatial Context in the Ancient Near East, Proceedings of the International Conference Organized by the Istituto Per gli Studi Micenei ed Egeo-Anatolici, (Essays edited by. A. Archi), Roma, 196-206.
- Bahar, H. Çay, T. and İşcan, F. (2007) The land and city of Tarhuntassa Geodetic Researches Around it, XXI *International CIPA Symposium*, 01-06 October 2007, Athens, Greece.
- Bartie, P. Mills, S. and Kingham, S. (2008) *Geospatial Vision New Dimensions in Cartography*. An Egocentric Urban Viewshed: A Method for Landmark Visibility Mapping for Pedestrian Location Based Services, Chapter 4., pp. 61-85. Springer, Berlin, Heidelberg. ISBN: 978-3-540-70967-1.
- Bittel, K. (1953) Beitrag zu Eflatunpınar. *Bibliotheca Orientalis* X, Vol.1/2, pp.-5.
- Bozdağ, A., Ince, I., Bozdağ, A., Hatır, M.E., Tosunlar, M.B. and Korkanç, M. (2020) An assessment of deterioration in cultural heritage: the unique case of Eflatunpınar Hittite Water Monument in Konya, Turkey. *Bulletin of Engineering Geology and the Environment*, Vol.79, pp.1185-1197.
- Christopherson, G., L. and Guertin, D.P. (1996) Visibility analysis and ancient settlement strategies in the region of Tall al-Umayri, Jordan. *Paper presented at the Annual Meeting of the American Schools of Oriental Research*, New Orleans, Louisiana.
- Ciminale, M., Gallo, D., Lasaponara, R. and Masini, N. (2009) A multiscale approach for reconstructing archaeological landscapes: Applications in Northern Apulia (Italy). *Archaeological Prospection*, Vol.16, pp.143-153.
- Darga, MA. (1992) *Hitit Sanatı*. Akbank Kültür ve Sanat Kitapları 56, İstanbul.
- Erkanal, A., (1980) Eflatun Pınar Anıtı, *Beseri Bilimler Dergisi*, Özel sayı 287-301.
- Gaffney, V. Stancic, Z. and Watson, H. (1995) The impact of GIS on archeology: a personal perspective. In G.R. Lock and G. Stancic (eds.), *Archeology and geographical information systems: A European perspective*, pp. 211-230. Hong Kong, Taylor and Francis.
- Gao, C. Wang, X. Jiang, T. and Jin, G. (2009) Spatial distribution of archaeological sites in lakeshore of Chao-hu Lake in China based on GIS. *Chinese Geographical Science*, Vol. 4, pp. 333-340.
- Goetze, A. (1933) *Die Annalen des Muršiliš: Mitteilungen der VorderasiatischAegyptischen Gesellschaft (E.V.)*, 38. Leipzig, J.C. Hinrichs'sche Buchhandlung.
- Goetze, A. (1940) *Kizzuwatna And The Problem of Hittite Geography*, New Haven.
- Gümüş, M. G. Durduran, S. S. Bozdağ, A. and Gümüş, K. (2017) GIS Investigation of Site Selection of Historical Structures: The Case of Knidos (Datça, Turkey), *Mediterranean Archaeology and Archaeometry*, Vol. 17, No 2, 149-157

- Kaimaris, D (2018) ancient theaters in Greece and the contribution of geoinformatics to their macroscopic constructional features. *SCIENTIFIC CULTURE*, Vol. 4, No. 3, pp. 9-25. DOI: 10.5281/zenodo.1409800
- Karauğuz, G. (2005) *Arkeolojik ve Filolojik Belgeler Işığında M.Ö. II. Binde Orta Anadolu'nun Güney Kesimi*, Çizgi Kitabevi, ISBN: 9758867334, Konya.
- Karauğuz, G. Çorumluoğlu, Ö. Kalaycı, İ. and Asri, İ. (2009) 3D Photogrammetric model of Eflatunpinar monument at the age of Hittite empire in Anatolia, *Journal of Cultural Heritage* Vol. 10, pp. 269-274.
- Kealy, S., Louys, J. and O'Connor, S. (2017) Reconstructing palaeogeography and inter-island visibility in the Wallacean Archipelago during the likely period of Sahul Colonization, 65-45 000 years ago. *Archaeological Prospection*, Vol. 24(3): pp. 259-272. doi:https://doi.org/10.1002/arp.1570
- Kol, Ç. and Küpçü, S. (2008) *Esri Arc Gıs Spatial Analiz, Arcview, Arceditor ve Arcinfo için*
- Leidwanger, J. (2013) Modeling distance with time in ancient Mediterranean seafaring: a GIS application for the interpretation of maritime connectivity. *Journal of Archaeological Science*, Vol. 40, pp. 3302-3308.
- Li, F. (2008) Application and perspective of GIS in research historical geography and cultural geography. *Geography Geo-Information Science*, Vol.24(1), pp. 21-26.
- Mellaart, J. (1962) The Late Bronze Age Monuments of Eflatun Pınar and Fasıllar Near Beysehir, *Anatolian Studies*, XII, (III-II7).
- Murat, L. (2012) The Water Cults in Hittites, *Tarih Araştırmaları Dergisi*, Vol. 31(51), pp.125-158.
- Neubauer, W. (2004) GIS in archaeology – the interface between prospection and excavation. *Archaeological Prospection*, Vol. 11(3), pp. 159-166. doi:10.1002/arp.231
- Nixon, L. (2004) 37. Chronologies of Desire and The uses of Monuments: Eflatunpinar to Çatalhöyük and Beyond. *Archaeology, Anthropology and Heritage in the Balkans and Anatolia: The Life and Times of F. W. Hasluck, 1878-1920*. edited by David Shankland. Volume II. The Isis Press Istanbul: Isis Press, pp.429-452.
- Oğuz-Kırca, E. D. and Liritzis, I. (2017) Searching Ancient Territorium of Hygassos In Anatolia: Settlement Patterns and Spatio-Temporal Investigations Through Aerial and GIS Applications. *Geojournal*, Vol. 82, pp. 1-24.
- Öğütçü, S., and Kalaycı, İ. (2018) Accuracy and precision of network-based RTK techniques as a function of baseline distance and occupation time. *Arabian Journal of Geosciences*, Vol.11(13), pp. 354.
- Ökse, A. Tuba, (2011) Open Air Sancturries of the Hittites. *Insights Into Hittite History and Archaeology*, Ed. Hermann Genz and Dirk Paul Mielke.
- Öksüz, A.M., Erdem, R. and Meshur, M.Ç. (2015) Koruma odaklı kırsal alan planlaması: Bir model önerisi (Conservation-oriented rural planning: A model proposal) (Report No. 108G187), TÜBİTAK-KAMAG 1007.
- Önem, A. B. and Kılınçaslan, İ. (2005) Urban identity and environmental perception in Halic, İTÜ dergisi/a, Mimarlık, planlama ve tasarım, 4 (1), 115-125.
- Pişkin, G. (2011) Spatial Analysis of Archaeological Settlements in Aliağa and Its Surroundings Using GIS. Master Thesis in Graduate School of Social Sciences, Ege University, İzmir, Turkey.
- Rennell, R. (2012) Landscape, Experience and GIS: Exploring The Potential for Methodological Dialogue. *Journal of Archaeological Method and Theory*, Vol. 19, pp. 510-525.
- Richards-Rissetto, H. (2017) What can GIS+3D Mean for Landscape archaeology?. *Journal of Archaeological Science*, Vol. 84, pp. 10-21.
- Singer, I. (1996) *Muwatalli's Prayer to the Assembly of Gods Through the Storm-God of Lightning (CTH 381)*, Atlanta, Georgia.
- Tsiafaki, D and Michailidou, N (2015) Benefits and problems through the application of 3d technologies in archaeology: recording, visualisation, representation and reconstruction. *SCIENTIFIC CULTURE*, Vol. 1, No 3, 37-45 DOI: 10.5281/zenodo.18448
- Uysal, C. (2008) Integration of remote sensing and geographic information systems in archaeological applications. Master's thesis, Retrieved from Council of Higher Education Thesis Center. (Accession No. 251644).
- Varlık, A. Selvi, H. Z. Kalaycı, İ. Karauğuz, G. and Öğütçü, S. (2016) Investigation Of The Compatibility of Fasıllar and Eflatunpinar Hittite Monuments With Close-Range Photogrammetric Technique. *Mediterranean Archaeology and Archaeometry*, Vol. 16, No 1, 249-256.
- Yakar, M. Yıldız, F. Zeybek, M. Kocaman, E. Yolcu, M. and Filiz, T. (2011) Photogrammetric Modeling of Monuments Eflatunpinar (Lilac-Coloured Spring), *FIG Working Week*, 18-22 Mayıs. Fas.

- Yalcin, F. (2016) *Huđlu av tñfekleri saha arařtırması raporu (Field survey report of Huglu hunting rifles)*. Retrieved from Mevlana Developmant Agency website: <http://www.mevka.org.tr/Page.asp?Dil=0&pid=227>
- Yiđit-Fethi, F. İleri, Ö. Avcı, K. M. and Kocadere, B. (2015) Eđirdir ve Beyřehir Gñllerinin Uydu Verileri ve Topođrafik Harita Yardımıyla Kıyı Çizgisi Deđişimleri, *Dođal Kaynaklar ve Ekonomi Bñlteni*, 20, 37-45